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Evaluation of Nutritional Composition of Water Lily (*Nymphaea lotus* Linn.) From Tatabu Flood Plain, North-central, Nigeria

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ABSTRACT

The high cost of fish feed especially in the developing countries has led to the dwindling economic fortunes on aquaculturists and slow pace of expansion of intensive fish culture in the underdeveloped world. To forestall this challenge, efforts are now geared towards the use of non-conventional fish feed, thus making aquaculture more cost effective to farmers. One of the options is the use of aquatic macrophytes. In this study, the nutritional potential of the plant parts (leaves, petiole, root, rhizome) and seeds of Water lily harvested from Tatabu flood plain/wetlands were evaluated through proximate compositions and analyzed in percentages. Moisture content was highest in the rhizome (20.40±1.241) while the seeds gave the lowest value of (4.18±0.176). The highest value for Ash content was observed in the root (27.36±1.261) and the seeds gave the lowest (2.81±0.498). Highest value for the Crude fat was obtained from the seeds (9.95±0.637) while the petiole gave the lowest value of (2.27±0.377). The crude protein and crude fibre values were highest in the leaves 19.54±0.782 and 15.53±0.448, respectively while the lowest was obtained in the seeds 3.27±0.104 and 1.60±0.200, respectively. There was a significant differences among the parts analyzed for the Ash content ($p<0.05$). The NFE varied from 31.21±2.176 to 78.15±1.418. This study suggests that Water lily could be a good source of protein for incorporation in fish diet.

Key words: Flood plain, water lily, proximate composition, fish diet, protein

INTRODUCTION

Aquatic plants grow profusely in lakes and waterways all over the world and have both negative and positive implication on water bodies. Eradication of these plants has proved almost impossible and even reasonable control is difficult. Turning these plants to productive use would be desirable if it would partly offset the costs involved in mechanical removal. Among other uses, there has been considerable interest in using aquatic plants as a source of animal feed (NAS, 1976). There is an increasing cost per unit production arising from supplementary feedstuff which is a major expenditure in fish culture (New and Csavas, 1993; Mukhopadhyay and Jena, 1999). The slow pace in the development of aquaculture in the developing countries like Nigeria has been attributed to high cost of fishmeal, Soybean meal and groundnut oil cake (Fasakin *et al*., 1999). These are conventional ingredients needed for fish feed formulation. Moreso, it makes more economic sense to match intensive fish production with that available. This challenges have necessitated the need for the use of non-conventional fish feed. This necessity has also been corroborated by Ali *et al*. (2006), who reported that efforts are now geared towards the use of non conventional feed sources as ingredients in fish feed. *Nymphaea lotus* is an aquatic plant that is rooted in shallow water with the asexual parts emerging above the water surface. It is commonly found freshwater ecosystem and are submerged in water (Fulekar, 2005). It is one of the foremost aquatic macrophytes that have been identified in Nigerian freshwater bodies (Obot and Ayeni, 1987). Impact of some macrophytes on water bodies have been highlighted by many authors (Obot, 1984; Mbagwu and Adeniji, 1988; Ita, 1993; Ogunlade, 1996). However, there is dearth of information on Water lily despite its presence on many of our fresh water bodies in the country and its usefulness among the fisher folk (Mohammed and Awodoyin, 2008). This macrophyte usually forms one of the most common macrophytes that grow throughout the year on our shallow water bodies including fish ponds. Unfortunately information on the agronomical characteristics and nutritive value which is important to aquaculture is highly limited. Furthermore, it has been observed that people of the North Eastern part of this country eat and market the seeds of Water lily (Un-published). Study conducted on ethno-botanical uses and socio-economic importance of Water lily to the fishing communities in the Kainji Lake Basin revealed that the people do utilize the leaves, petiole, roots and seeds in preparation of concoction for different ailment and consumption (Mohammed *et al*., 2008). However, before advocating the utilization of this weed for supplementation of fish/livestock feeds, there is need to explore the nutritional quality and anti-nutritional composition. The present study was undertaken to investigate the nutritional potential (proximate analysis) of Water lily to ascertain its suitability for use as fish feed.

MATERIALS AND METHODS

Sampling site: The experimental macrophyte, Water lily, was harvested from Tatabu flood plains/wetlands. Three samples of the macrophyte were collected from the study site and send to the laboratory for analytical processes. The macrophyte categorized into four parts, viz., leaves, petioles, roots and rhizomes, all in triplicate were subjected to proximate analysis.

Laboratory analysis: The samples were thoroughly washed, dried and weighed. The proximate analyses for moisture, ash, lipid (fat) content, crude protein and crude fibre were carried out in triplicates according to the methods described by AOAC (1990). Nitrogen was determined by the micro-Kjeldahl method as modified by Cocon and Diane (1973) and the nitrogen content was converted to protein by multiplying by 6.25 (Jeanette, 1987). All proximate results were expressed as percentage of sample analysed.

Statistical analysis: Results of the proximate analysis were subjected to Analysis of Variance (ANOVA) and the significant means were compared using least square difference at 5% probability level.

RESULTS AND DISCUSSION

The proximate composition of the Water lily samples collected from Tatabu flood plain/wetlands on dry weight basis are presented in Table 1. Table 1 shows the mean of percentage moisture content, ash content, crude fat, crude protein and crude fibre for the five sampled parts of Water lily which consists of leaves, petioles, roots, rhizomes and seeds. Significant differences ($p<0.05$) existed in the percentage ash content, crude fat, crude protein, crude fibre and nitrogen free extract between these sampled plant parts of water lily. There was no significant differences in the percentage moisture content between the leaves, petiole and seeds as well as in root and rhizome ($p>0.05$). However, significant differences was observed in percentage moisture content in leaves and root, petiole, root and rhizome ($p<0.05$). The seeds had the least range of moisture content of

Table 1: Proximate composition (%dry weight) of harvested parts of water lily from Tatabu flood plain

Parameter (%)	Leaves	Petiole	Root	Rhizome	Seeds
Moisture content	6.40 ± 0.321^{a}	6.17 ± 0.344^{a}	4.85 ± 0.377^{b}	20.40 ± 1.241^{b}	4.18 ± 0.176^{a}
Ash content	14.48 ± 0.340^{a}	27.36 ± 1.261^{b}	22.55 ± 1.030^{c}	9.68 ± 0.193^{d}	2.81 ± 0.498^{e}
Crude fat	4.83 ± 0.210^{a}	02.27 ± 0.380^{b}	2.93 ± 0.180^{c}	2.82 ± 0.260^{c}	9.95 ± 0.640^{d}
Crude protein	19.54 ± 0.780^{a}	09.04 ± 0.190^{b}	5.03 ± 0.320^{c}	11.47 ± 0.320^{d}	3.27 ± 0.100^{e}
Crude fibre	15.53 ± 0.450^{a}	15.10 ± 0.780^{b}	12.53 ± 0.450^{c}	13.24 ± 0.350^{d}	1.60 ± 0.200^{e}
Nitrogen free extract	44.78 ± 2.100^{a}	34.74 ± 12.00^{b}	42.71 ± 15.00^{c}	31.21 ± 2.180^{d}	78.15 ± 1.420^{e}

Values are Mean±SE, n = 3, Similar letters with in column represent means that are not significantly different at $p>0.05$

(4.18±0.176%) while the rhizome has the highest range of moisture content of (20.40±1.241%) with no significant difference ($p>0.05$) among the plant parts. This equally exhibits one of the characteristics of emergent aquatic plant (Little, 1979). The percentage ash content of the samples analyzed shows a high value obtained for the petioles (27.36±1.261%). The percentage crude fat recorded the minimal value of nutrients in all the samples collected and analyzed. The seeds recorded the highest value crude fat of (9.95±0.637%) which might be due to the oily nature of the seeds. The highest percentage crude protein was obtained from the leaves (19.54±0.782%) while the minimal value was recorded in the seeds (3.27±0.104%). The crude protein content of Water lily leaves obtained in this study is higher than that obtained for water hyacinth leaves (15.29%) (Okoye *et al.*, 2000), palm kernel cake (19.06%) (Eyo, 1994) and close to duck weed (26.30%) (Mbagwu and Adeniji, 1988). Crude protein is an important feed ingredient normally used as a major ingredient in fish feed formulation. The value of crude fibre varies from (1.6±0.20%) in the seeds to (15.53±0.0448%) in the leaves. The results obtained in this study were higher when compared to Anjana and Matai (1990) results of ash: 14.1% and crude protein: 16.8 and lipid: 2.6%.

CONCLUSION

In conclusion, the proximate analysis of five different parts of Water lily (leaves, petioles, roots, rhizomes and seeds) has demonstrated that among, the tested aquatic macrophytes, Water lily could be a good source of protein for incorporation in fish diet. Though, some anti-nutritional factors may be present in this macrophyte but it has not been evaluated. Therefore, there is need to carry out detail study on its mineral composition and other important anti-nutritional factors.

REFERENCES

AOAC., 1990. Official Method of Analysis. 15th Edn., Association of Official Analytical Chemists, Washington, DC.

Ali, M.Z., M. Zaher, R. Parveen, M.G. Hussain and M.A. Mazid, 2006. The use of alternate feeding schedules on the growth performance and reduction of cost of production for Thai pangas, *Pangasius hypophthalmus* (Sauvage, 1878) in ponds. J. Aquacult. Trop., 21: 149-156.

Anjana, B. and S. Matai, 1990. Composition of Indian aquatic plants in relation of utilization as animal forage. J. Aquat. Plant Manage., 28: 69-73.

Cocon, M. and V.J. Diane, 1973. Analysis of Protein and Amino Acids. Oxford University Press, London.

Eyo, A.A., 1994. The requirements for formulating standard artificial fish feeds. Proceedings of the 11th Annual Conference of the Fisheries Society of Nigeria, February 22-24, 1994, Ikeja, Lagos, Nigeria.

Fasakin, E.A., A.M. Balogun and B.E. Fasuru, 1999. Use of duckweed, *Spirodela polyrrhiza* L. Schleiden, as a protein feedstuff in practical diets for tilapia, *Oreochromis niloticus* L. Aquacult. Res., 30: 313-318.

Fulekar, M.H., 2005. Environmental Biotechnology. Oxford and IBH Publishing Co. Pvc Ltd., New York.

Ita, E.O., 1993. Aquatic plants and wetland wildlife resources of Nigeria. CIFA Occasional Paper No. 21, FAO, Rome.

Jeanette, E., 1987. Sorghum Quality Laboratory Manual for Use in West Africa. Oxford University Press, UK.

Little, E.C.S., 1979. Utilization of aquatic plants FAO kein kein. Center for Aquatic Plants, Institute of Food and Agricultural Sciences.

Mbagwu, I.G. and H.A. Adeniji, 1988. The nutritional content of duckweed (*Lemna pausicostata* Hegelm) in the Kainji lake area, Nigeria. Aquat. Bot., 29: 357-366.

Mohammed, H.A, R.O. Awodoyin, F. Daddy and G.O. Adesina, 2008. Ethnobotany of Water lily (*Nymphaea lotus* Linn) among the riparian communities in Nigeria: A case Study of Kainji Lake Basin. Biolog. Environ., 5: 52-55.

Mohammed, H.A. and R.O. Awodoyin, 2008. Growth ecology of an aquatic macrophyte *Nymphaea lotus* Linn from Nigerian inland-water. J. Plant Sci., 3: 99-104.

Mukhopadhyay, P.K. and J.K. Jena, 1999. Use of Non-Conventional Dietary Ingredients in Fish Feed Formulation. In: Ichthyology: Recent Research Advances, Saksena. D.N. (Ed.). Oxford IBH Publishing House Co. Pvt. Ltd., New Delhi, Calcutta, pp: 225-248.

NAS, 1976. Making Aquatic Weeds Useful Some Perspectives for Developing Countries. NAS Pub., Washington, DC., USA., Pages: 174.

New, M.B. and I. Csavas, 1993. A Summary of Information on Aquafeed Production in Eleven Asian Countries. In: Farm Feed Aquafeeds, New, M.B., A.G.J. Tacon and I. Csavas (Eds.). FAO-RAPA/AADCP, Bangkok, Thailand, pp: 397-419.

Obot, E.A. and J.S.O. Ayeni, 1987. A Hand Book of Common Aquatic Plants of the Kainji Lake Basin. National Institute for Freshwater Fisheries Research. Saolog Printing Productions, New Bussa.

Obot, E.A., 1984. Studies in the productivity of *Echinocloa stagnina* (Retz) P. Beauv in the Kainji Lake Basin of Northern Nigeria. Ph.D. Thesis, University of Ife, Nigeria.

Ogunlade, Y., 1996. The Chemistry of Water Hyacinth in Nigerian Waterways. Government Printing Press, Akure Ondo State, Nigeria.

Okoye, F.C., F. Daddy and B.D. Ilesanmi, 2000. The nutritive value of water hyacinth and its utilization in fish feed. Proceedings of the International Conference on Water Hyacinth, Oct. 27-Nov. 1, New Bussa, pp: 65-70.